



# REED COLLEGE

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November 14, 2012

U.S. Nuclear Regulatory Commission  
Mail Stop O12-G13  
Washington, DC 20555-0001

Re: Report for Apparent Technical Specification Violation

Docket 50-288

Attached is the special report as required under Reed College Technical Specification 6.7.2 (a)(4).

Melinda Krahenbuhl, Ph.D.

Director, Reed Research Reactor

IE22  
A020  
NRR

Reed Reactor Facility, Docket No. 50-288:  
Apparent Violation of TS 3.2.2, 3.2.3 and 4.2(e)

Summary

On November 1, 2012, the logarithmic (log) channel was rendered inoperable by the placement of an electronic readout for an experiment. The reactor was operated for 12 minutes prior to identification of the compromised log channel. Upon identification, the reactor was scrammed. The electronic readout was relocated. The readings for the log channel returned to normal. The operability of the log channel was tested by moving the AmBe source out of the core. Reactor operations were suspended until Nov. 2, 2012. A corrective action report to was initiated on Nov. 2, 2012. Immediate actions taken include: marking off the area on the bridge and operational staff training on Nov. 12, 2012. Notifications were made to NRC Operations Center (11/01/2012 16:46), Geoffrey Wertz; US NRC Project Manager (11/01/2012), Patrick McDougal Reactor Operation Committee Chair and Dean of Faculty Reed College (11/01/2012), Kathleen Fisher, Radiation Safety officer Reed College (11/01/2012). The Reactor Operations Committee was informed on 11/05/12.

The Event

At 11:17 PDT, while the reactor was secured, an electronic readout for a new experimental apparatus was installed on the bridge above the core. The readout interfered electronically with the preamplifier for the log power channel, rendering the power channel inoperable, including the source interlock. The interference was not noticed at the time.

At 11:27, the reactor operator began core excess. While the reactor was and stabilizing at 5 W, it was noticed that the log power channel was reading incorrectly. The digital chart recorder showed that the reading had remained constant, and implausibly high, while the actual power increased during start up. The power increase was charted through the linear power channel output. The SRO of record immediately instructed the operator to SCRAM and secure the reactor, which was done at 11:39.

The log channel was restored to operability at 11:56 by relocating the electronic readout. Operability of the channel was verified by moving the AmBe source out the core. Reactor operations were suspended until Nov 2, 2012. Operability of the log channel was verified again during the start up for 11/2/2012.

The relevant technical specifications are:

TS 3.2.2 The reactor shall not be operated unless the reactor power measuring channels in Table 2 are operable.

**Table 2: Power Measuring Channels<sup>1</sup>**

Measuring Channel	Minimum Number Operable
Percent Power Channel	1
Linear Channel	1
Logarithmic Channel	1

1. Any single channel may be inoperable while the reactor is operating for the purpose of performing a channel check, test or calibration.

TS 3.2.3 Specifications. The reactor shall not be operated unless the minimum number of safety channels described in Table 3 and interlocks described in Table 4 are operable.

**Table 3: Minimum Reactor Safety Channels**

Safety Channel	Function	Minimum Number
Percent Power	Scram at 275 kW or less	1
Linear Power	Scram at 275 kW or less	1
Loss of High Voltage	Scram	2
Console Manual Scram	Scram	1

**Table 4: Minimum Interlocks**

Interlock	Function	Minimum Number
Source Interlock	Prevent control rod withdrawal with neutron-induced signal less than $10^{-7}\%$ of full power	1
Control Rod Drive Circuit	Prevent simultaneous manual withdrawal of two control rods	1

#### The Cause

The inoperability of the log channel was caused by the electronic interference. The violations of the technical specifications are the result of the operator failure to recognize the state of the log channel. During the analysis several factors were noted that are relevant. The operator had been told that the log channel was not reliable during his training. Although the possibility of electronic interference with the log channel preamp was known by a few, the knowledge has not been included in training or documentation. The operator may have been distracted by the trainee who was operating under direction. The conversion between the readout of the log channel, linear channel and percent power are not in the same units.

#### Corrective Actions

The following actions were taken to remediate the primary causes and to prevent this type of event from reoccurring. The area above the preamp has been marked off to remind the staff not to place electronic equipment over the log channel's preamp. The function, sensitivity accuracy and precision were addressed in the requalification meeting held Nov. 12, 2012. The operators and senior reactor operators that participate in training were told to teach, remind, and or correct statements regarding the use of the log channel for start-up and steady state operation.